The Claims

1.   (Currently Amended) ~~Cluster management software comprising:~~ Software residing at one or more computer systems collectively operable to execute the software, the software comprising:

a plurality of cluster agents, each cluster agent associated with ~~an HPC node including an integrated fabric and the cluster agent~~ one of a plurality of nodes, each node comprising a switching fabric integrated to a card and at least two processors integrated to the card, the cluster agent operable to determine a status of the associated ~~HPC~~ node; and

a cluster management engine communicably coupled ~~with the plurality of the HPC nodes and operable to execute an HPC job using a dynamically allocated subset of the plurality of HPC nodes based on the determined status of the plurality of HPC nodes~~ to the plurality of nodes and operable to dynamically allocate a particular subset of the plurality of nodes to a particular job based on the determined status of each of one or more of the plurality of nodes and execute the job using the particular subset.

2.   (Currently Amended) The ~~cluster management~~ software of Claim 1, wherein the cluster management engine is further operable to determine a topology of the plurality of nodes based, at least in part, on the determined status of the ~~HPC~~ nodes.

3.   (Currently Amended) The ~~cluster management~~ software of Claim 2, wherein the topology ~~comprising~~ comprises a three dimensional Torus.

4.   (Currently Amended) The ~~cluster management~~ software of Claim 1, wherein the cluster management engine is further operable to dynamically allocate a virtual cluster in the plurality of ~~HPC~~ nodes, the ~~dynamically allocated~~ particular subset ~~for executing~~ dynamically allocated to the ~~HPC~~ job comprising at least a subset of the virtual cluster.

5.   (Currently Amended) The ~~cluster management~~ software of Claim 4, <u>wherein</u> the cluster management engine <u>is</u> further operable to:

dynamically allocate a second <u>particular</u> subset of ~~HPC~~ nodes in the virtual cluster; and

execute a second ~~HPC~~ job using the second <u>particular</u> subset.

6.   (Currently Amended) The ~~cluster management~~ software of Claim 4, <u>wherein</u> the virtual cluster <u>is</u> associated with a user group.

7.   (Currently Amended) The ~~cluster management~~ software of Claim 6, <u>wherein</u> the cluster management engine <u>is</u> further operable to verify a user submitting the ~~HPC~~ job based, at least in part, on the user group.

8.   (Currently Amended) The ~~cluster management~~ software of Claim 4, <u>wherein</u> the cluster management engine <u>is</u> further operable to dynamically allocate a second virtual cluster in the plurality of ~~HPC~~ nodes.

9.   (Currently Amended) The ~~cluster management~~ software of Claim 8, <u>wherein</u> the second virtual cluster ~~comprising~~ <u>comprises</u> different ~~HPC~~ nodes from the first virtual cluster.

10.   (Currently Amended) The ~~cluster management~~ software of Claim 1, ~~wherein the cluster management engine operable~~ <u>wherein,</u> to execute the ~~HPC~~ job using the ~~dynamically allocated~~ <u>particular</u> subset ~~comprises the cluster management engine operable,</u> the cluster management engine is operable</u> to:

receive a job request comprising ~~at least one job parameter~~ <u>one or more job parameters</u>;

determine dimensions of the ~~HPC~~ job based, at least in part, on the one or more job parameters;

dynamically allocate the <u>particular</u> subset ~~of the plurality of HPC nodes~~ based, at least in part, on the determined dimensions; and

execute the ~~HPC~~ job using the ~~dynamically allocated~~ <u>particular</u> subset.

11.   (Currently Amended) The ~~cluster management~~ software of Claim 10, <u>wherein</u> the cluster management engine <u>is</u> further operable to:

select a policy based on the job request; and

dynamically determine the dimensions of the ~~HPC~~ job further based on the selected policy.

12.   (Currently Amended) A method ~~for managing clusters~~ comprising:

determining a status of <u>each of at least</u> a subset of a plurality of ~~HPC~~ nodes, each node comprising ~~an integrated fabric; and~~ <u>a switching fabric integrated to a card and at least two processors integrated to the card;</u>

<u>dynamically allocating a particular subset of the plurality of nodes to a particular job based on the determined status of each of one or more of the plurality of nodes; and</u>

executing ~~an HPC~~ <u>the</u> job using ~~a dynamically allocated~~ <u>the particular</u> subset ~~of the plurality of HPC nodes, the subset allocated based on the determined status~~.

13.   (Currently Amended) The method of Claim 12, further comprising determining a topology of the plurality of nodes based, at least in part, on the determined status ~~from~~ <u>of</u> the ~~HPC~~ nodes.

14.   (Currently Amended) The method of Claim 13, <u>wherein</u> the topology ~~comprising~~ <u>comprises</u> a three dimensional Torus.

15.   (Currently Amended) The method of Claim 12, further comprising dynamically allocating a virtual cluster in the plurality of ~~HPC~~ nodes, the ~~dynamically allocated~~ <u>particular</u> subset ~~for executing the HPC~~ <u>dynamically allocated to the</u> job comprising at least a subset of the virtual cluster.

6

16.   (Currently Amended) The method of Claim 15, further comprising:

dynamically allocating a second <u>particular</u> subset of ~~HPC~~ nodes in the virtual cluster; and

executing a second ~~HPC~~ job using the second <u>particular</u> subset.

17.   (Currently Amended) The method of Claim 15, <u>wherein</u> the virtual cluster <u>is</u>

associated with a user group.

18.   (Currently Amended) The method of Claim 17, further comprising verifying a

user submitting the ~~HPC~~ job based, at least in part, on the user group.

19.   (Currently Amended) The method of Claim 15, further comprising dynamically

allocating a second virtual cluster in the plurality of ~~HPC~~ nodes.

20.   (Currently Amended) The method of Claim 19, <u>wherein</u> the second virtual cluster

~~comprising~~ <u>comprises</u> different ~~HPC~~ nodes from the first virtual cluster.

21.   (Currently Amended) The method of Claim 12, wherein executing the ~~HPC~~ job

using the ~~dynamically allocated~~ <u>particular</u> subset comprises:

    receiving a job request comprising ~~at least one job parameter~~ <u>one or more job parameters</u>;

    determining dimensions of the ~~HPC~~ job based, at least in part, on the one or more job

parameters;

    dynamically allocating the <u>particular</u> subset ~~of the plurality of HPC nodes~~ based, at least

in part, on the determined dimensions; and

    executing the ~~HPC~~ job using the ~~dynamically allocated~~ <u>particular</u> subset.

22.   (Currently Amended) The method of Claim 21, further comprising:

selecting a policy based on the job request; and

dynamically determining the dimensions of the ~~HPC~~ job further based on the selected

policy.

23.   (Currently Amended) A ~~cluster management~~ system comprising:

a plurality of ~~HPC~~ computing nodes, each computing node ~~including an integrated fabric and operable to communicate a status; and~~ comprising a switching fabric integrated to a card and at least two processors integrated to the card, the computing node further comprising an agent operable to determine a status of the computing node and communicate the status to a management node;

~~a management node~~ the management node, communicably coupled ~~with the plurality of the HPC nodes and operable to execute an HPC job using a dynamically allocated subset of the plurality of HPC nodes~~ to the plurality of computing nodes and operable to dynamically allocate a particular subset of the plurality of computing nodes to a particular job based on the determined status of each of one or more of the plurality of computing nodes and execute the job using the particular subset.

24.   (Currently Amended) The system of Claim 23, wherein the management node is further operable to determine a topology of the plurality of nodes based, at least in part, on receiving the determined status from the ~~HPC~~ computing nodes.

25.   (Currently Amended) The system of Claim 24, wherein the topology ~~comprising~~ comprises a three dimensional Torus.

26.   (Currently Amended) The system of Claim 23, wherein the management node is further operable to dynamically allocate a virtual cluster in the plurality of ~~HPC~~ computing nodes, the ~~dynamically allocated~~ particular subset ~~for executing~~ dynamically allocated to the ~~HPC~~ job comprising at least a subset of the virtual cluster.

8

27.   (Currently Amended) The system of Claim 26, <u>wherein</u> the management node <u>is</u> further operable to:

dynamically allocate a second subset of ~~HPC~~ <u>computing</u> nodes in the virtual cluster; and execute a second ~~HPC~~ job using the second subset.

28.   (Currently Amended) The system of Claim 26, <u>wherein</u> the virtual cluster <u>is</u> associated with a user group.

29.   (Currently Amended) The system of Claim 28, <u>wherein</u> the management node <u>is</u> further operable to verify a user submitting the ~~HPC~~ job based, at least in part, on the user group.

30.   (Currently Amended) The system of Claim 26, <u>wherein</u> the management node <u>is</u> further operable to dynamically allocate a second virtual cluster in the plurality of ~~HPC~~ <u>computing</u> nodes.

31.   (Currently Amended) The system of Claim 30, <u>wherein</u> the second virtual cluster ~~comprising~~ <u>comprises</u> different ~~HPC~~ <u>computing</u> nodes from the first virtual cluster.

32.   (Currently Amended) The system of Claim 23, ~~wherein the management node operable~~ <u>wherein,</u> to execute the ~~HPC~~ job using the ~~dynamically allocated~~ <u>particular</u> subset ~~comprises the management node operable to,~~ <u>the management node is operable to</u>:

receive a job request comprising ~~at least one job parameter~~ <u>one or more job parameters</u>;

determine dimensions of the ~~HPC~~ job based, at least in part, on the one or more job parameters;

dynamically allocate the <u>particular</u> subset ~~of the plurality of HPC nodes~~ based, at least in part, on the determined dimensions; and

execute the ~~HPC~~ job using the ~~dynamically allocated~~ <u>particular</u> subset.

9

33.   (Currently Amended) The system of Claim 32, <u>wherein</u> the management node <u>is</u> further operable to:

select a policy based on the job request; and

dynamically determine the dimensions of the ~~HPC~~ job further based on the selected policy.

34.   (New) The software of Claim 1, wherein the card is a motherboard.

35.   (New) The method of Claim 12, wherein the card is a motherboard.

36.   (New) The system of Claim 23, wherein the card is a motherboard.

10

37.   (New) Software residing at one or more computer systems collectively operable to execute the software, the software comprising:

a plurality of cluster agents, each cluster agent associated with one of a plurality of nodes, the cluster agent operable to determine a status of the associated node, each node comprising:

at least two first processors integrated to a first card and operable to communicate with each other via a direct link between them; and

a first switch integrated to the first card, the first processors communicably coupled to the first switch, the first switch operable to communicably couple the first processors to six or more second cards each comprising at least two second processors integrated to the second card and a second switch integrated to the second card operable to communicably couple the second processors to the first card and at least five third cards each comprising at least two third processors integrated to the third card and a third switch integrated to the third card;

the first processors being operable to communicate with particular second processors on a particular second card via the first switch and the second switch on the particular second card;

the first processors being operable to communicate with particular third processors on a particular third card via the first switch, a particular second switch on a particular second card between the first card and the particular third card, and the third switch on the particular third card without communicating via either second processor on the particular second card; and

a cluster management engine communicably coupled to the plurality of nodes and operable to dynamically allocate a particular subset of the plurality of nodes to a particular job based on the determined status of each of one or more of the plurality of nodes and execute the job using the particular subset.

38.   (New) A method comprising:

determining a status of each of at least a subset of a plurality of nodes, each node comprising:

at least two first processors integrated to a first card and operable to communicate with each other via a direct link between them; and

a first switch integrated to the first card, the first processors communicably coupled to the first switch, the first switch operable to communicably couple the first processors to six or more second cards each comprising at least two second processors integrated to the second card and a second switch integrated to the second card operable to communicably couple the second processors to the first card and at least five third cards each comprising at least two third processors integrated to the third card and a third switch integrated to the third card;

the first processors being operable to communicate with particular second processors on a particular second card via the first switch and the second switch on the particular second card;

the first processors being operable to communicate with particular third processors on a particular third card via the first switch, a particular second switch on a particular second card between the first card and the particular third card, and the third switch on the particular third card without communicating via either second processor on the particular second card;

dynamically allocating a particular subset of the plurality of nodes to a particular job based on the determined status of each of one or more of the plurality of nodes; and

executing the job using the particular subset.

12

39.   (New) A system comprising:

a plurality of computing nodes, each computing node comprising:

an agent operable to determine a status of the computing node and communicate the status to a management node;

at least two first processors integrated to a first card and operable to communicate with each other via a direct link between them; and

a first switch integrated to the first card, the first processors communicably coupled to the first switch, the first switch operable to communicably couple the first processors to six or more second cards each comprising at least two second processors integrated to the second card and a second switch integrated to the second card operable to communicably couple the second processors to the first card and at least five third cards each comprising at least two third processors integrated to the third card and a third switch integrated to the third card;

the first processors being operable to communicate with particular second processors on a particular second card via the first switch and the second switch on the particular second card;

the first processors being operable to communicate with particular third processors on a particular third card via the first switch, a particular second switch on a particular second card between the first card and the particular third card, and the third switch on the particular third card without communicating via either second processor on the particular second card; and

the management node, communicably coupled to the plurality of computing nodes and operable to dynamically allocate a particular subset of the plurality of computing nodes to a particular job based on the determined status of each of one or more of the plurality of computing nodes and execute the job using the particular subset.